

JINGHAO DENG

Postdoctoral Associate, Cornell University

Ithaca, NY 14853, United States

jd2353@cornell.edu | Google Scholar | Personal Website

RESEARCH INTERESTS

Experimental condensed matter physics, with emphasis on strongly correlated and topological quantum states in two-dimensional materials. My research combines low-temperature scanning tunneling microscopy and spectroscopy, quantum transport, van der Waals device engineering, and molecular beam epitaxy to study quantum Hall states, emergent quasiparticles, electronic crystals, superconductivity, quantum magnetism, and interaction-driven symmetry breaking.

EMPLOYMENT

2024 - Present Postdoctoral Associate, LASSP, Cornell University

Advisor: Prof. Xiaomeng Liu

EDUCATION

2018 - 2024 M.S. and Ph.D. in Physics, Wuhan University

Thesis: *Symmetry Breaking Engineering of Novel States of Matter in Low-Dimensional van der Waals Materials*

Advisor: Prof. Chendong Zhang

2013 - 2017 B.S. in Physics, Jilin University.

SELECTED PUBLICATIONS AND PREPRINTS

[†]Corresponding author; *Equal contribution.

1. **J. Deng***, Y. Sun*, D. Pimenov, T. Taniguchi, K. Watanabe, E. J. Mueller[†], X. Liu[†]. “Real-space Imaging of Quantum Hall Quasiparticles.” *arXiv:2606.25036* (2026), *under review at Nature*. [Link]
2. **J. Deng**, J. Xie, H. Li, T. Taniguchi, K. Watanabe, J. Shan, K. F. Mak, X. Liu[†]. “Magnetic-field-induced superconductivity in hexalayer rhombohedral graphene.” *arXiv:2603.13498* (2026), *under review at Physical Review Letters*. [Link]
3. **J. Deng***, J. Xie*, H. Li*, T. Taniguchi, K. Watanabe, J. Shan, K. F. Mak, X. Liu[†]. “Superconductivity and ferroelectric orbital magnetism in semimetallic rhombohedral hexalayer graphene.” *arXiv:2508.15909* (2025), *accepted by Nature Physics*. [Link]
4. **J. Deng***, D. Guo*, Y. Wen*, S. Lu*, H. Zhang, Z. Cheng, Z. Pan, T. Jian, D. Li, H. Wang, Y. Bai, Z. Li, W. Ji[†], J. He[†], C. Zhang[†]. “Evidence of ferroelectricity in an antiferromagnetic vanadium trichloride monolayer.” *Science Advances* 11 (10), eado6538 (2025). [Link]
5. **J. Deng**, D. Huo, Y. Bai, X. Lin, Z. Cheng, C. Zhang[†]. “Observations of charge-Density-Wave states in W₆Te₆ Wires.” *Nano Letters* 23 (17), 7831-7837 (2023). [Link]
6. **J. Deng**, D. Huo, Y. Bai, Y. Guo, Z. Pan, S. Lu, P. Cui[†], Z. Zhang, C. Zhang[†]. “Precise tuning of band structures and electron correlations by van der Waals stacking of one-dimensional W₆Te₆ wires.” *Nano Letters* 20 (12), 8866-8873 (2020). [Link]

ADDITIONAL PUBLICATIONS

7. Y. Bai*, G. Cao*, **J. Deng***, H. Fei, X. Lin, L. Li, C. Zhu, Z. Pan, T. Jian, D. Huo, Z. Cheng, C.-K. Shih, P. Cui[†], C. Zhang[†], Z. Zhang. “Alternating-Chiral Charge Density Waves and Hybrid Ferrimagnetism in Monolayered NbTe₂.” *arXiv:2406.15835* (2024), *Nature Communications* in press. [Link]
8. C. Zhu*, J. Shi*, Y. Lu*, J. Feng*, Y. Liu, D. Huo, X. Lin, **J. Deng**, Z. Pan, H. Zhang, D. Li, Z. Li, F. Yang, R. Zhou, C. Liu, W. Ji[†], W. Zhou[†], F. Zhang[†], C. Zhang[†]. “Direct Observation of Two-Dimensional Electron Gas with Low Effective Mass in Atomically Thin InTe.” *Nano Letters* 26 (20), 6594–6602 (2026). [Link]
9. Z. Pan*, W. Xiong*, J. Dai*, H. Zhang*, Y. Wang, T. Jian, X. Cui, **J. Deng**, X. Lin, Z. Cheng, Y. Bai, C. Zhu, D. Huo, G. Li, M. Feng, J. He, W. Ji[†], S. Yuan[†], F. Wu[†], C. Zhang[†], H. Gao. “Ferromagnetism and correlated insulating states in monolayer Mo₃₃Te₅₆.” *Nature Communications* 16 (1), 3084 (2025). [Link]
10. Z. Cheng*, N. Liu*, **J. Deng**, H. Zhang, Z. Pan, C. Zhu, S. Lu, Y. Bai, X. Lin, W. Ji[†], C. Zhang[†]. “Twist-angle dependent pseudo-magnetic fields in monolayer CrCl₂/graphene heterostructures.” *Materials Horizons* 12, 473–479 (2025). [Link]
11. Z. Pan, T. Jian, H. Zhang, X. Lin, C. Zhu, **J. Deng**, Z. Cheng, C. Liu, C. Zhang[†]. “Unraveling the multistage phase transformations in monolayer MoTe_{2-x}.” *Applied Physics Letters* 125, 151601 (2024). [Link]
12. T. Jian, Y. Guo, S. Lu, **J. Deng**, Z. Cheng, Z. Pan, X. Lin, H. Zhang, C. Zhu, Y. Liu, C. Zhang[†]. “Grain boundaries in single-layer magnetic material CrCl₃.” *Applied Physics Letters* 125, 151604 (2024). [Link]
13. X. Lin*, **J. Deng***, Y. Bai*, D. Huo, C. Zhu, Z. Pan, T. Jian, C. Liu[†], C. Zhang[†]. “van der Waals Engineering of Charge Density Waves in One-Dimensional Nb₆Te₆ Nanowires.” *ACS Nano* 18 (20), 13241–13248 (2024). [Link]
14. S. Lu*, D. Guo*, Z. Cheng*, Y. Guo*, C. Wang, **J. Deng**, Y. Bai, C. Tian, L. Zhou, Y. Shi, J. He[†], W. Ji[†], C. Zhang[†]. “Controllable dimensionality conversion between 1D and 2D CrCl₃ magnetic nanostructures.” *Nature Communications* 14, 2465 (2023). [Link]
15. D. Huo, Y. Bai, X. Lin, **J. Deng**, Z. Pan, C. Zhu, C. Liu[†], C. Zhang[†]. “Visualizing interface states in In₂Se₃–WSe₂ monolayer lateral heterostructures.” *Chinese Physics B* 32, 056803 (2023). [Link]
16. Y. Bai*, T. Jian*, Z. Pan, **J. Deng**, X. Lin, C. Zhu, D. Huo, Z. Cheng, Y. Liu, P. Cui, Z. Zhang, Q. Zou[†], C. Zhang[†]. “Realization of Multiple Charge-Density Waves in NbTe₂ at the Monolayer Limit.” *Nano Letters* 23 (6), 2107–2113 (2023). [Link]
17. D. Huo, Y. Bai, X. Lin, **J. Deng**, Z. Pan, C. Zhu, C. Liu, H. Yu[†], C. Zhang[†]. “Tuning of the Valley Structures in Monolayer In₂Se₃/WSe₂ Heterostructures via Ferroelectricity.” *Nano Letters* 22 (17), 7261–7267 (2022). [Link]
18. Y. Guo*, L. Wu*, **J. Deng***, L. Zhou, W. Jiang, S. Lu, D. Huo, J. Ji, Y. Bai, X. Lin, S. Zhang, H. Xu, W. Ji[†], C. Zhang[†]. “Band alignment and interlayer hybridization in monolayer organic/WSe₂ heterojunction.” *Nano Research* 15, 1276–1281 (2022). [Link]
19. K. Liu*, X. Chen*, P. Gong, R. Yu, J. Wu, L. Li, W. Han, S. Yang, C. Zhang, **J. Deng**, A. Li, Q. Zhang, F. Zhuge, T. Zhai[†]. “Approaching strain limit of two-dimensional MoS₂ via chalcogenide substitution.” *Science Bulletin* 67 (1), 45–53 (2022). [Link]
20. S. Lu*, M. Huang*, G. Huang, Q. Guo, H. Li, **J. Deng**, C. Zhang[†], Y. Yu[†]. “Two ‘braking mechanisms’ for Tin phthalocyanine molecular rotor on dipolar oxide iron surfaces.” *Nanoscale Advances* 4, 1213–1219 (2022). [Link]

21. S. Lu, H. Nam, P. Xiao, M. Liu, Y. Guo, Y. Bai, Z. Cheng, **J. Deng**, Y. Li, H. Zhou, G. Henkelman, G. A. Fiete, H.-J. Gao, A. H. MacDonald, C. Zhang[†], C.-K. Shih[†]. “PTCDA Molecular Monolayer on Pb Thin Films: An Unusual π -Electron Kondo System and Its Interplay with a Quantum-Confined Superconductor.” *Physical Review Letters* 127, 186805 (2021). [Link]

AWARDS AND HONORS

- National scholarship for doctoral students, China, 2021.

EXPERIMENTAL EXPERTISE

Scanning Tunneling Microscopy: ^3He -temperature and high-magnetic-field STM/STS; spectroscopic imaging STM (SI-STM); Landau-level spectroscopy; quasiparticle interference; defect and bound-state spectroscopy.

2D Quantum Devices: Van der Waals heterostructure assembly; high-quality multilayer graphene/hBN devices; integration of gated devices with STM; electrostatic control of correlated and quantum Hall states.

Cryogenic and Ultra-high-vacuum Instrumentation: Low-temperature STM maintenance, optimization, and development; dilution-refrigerator operation and maintenance; low-noise electrical wiring and filtering; cryogenic troubleshooting; cryogen-free and liquid-helium superconducting magnet systems; lock-in-based low-temperature measurements; helium-recovery system installation, operation, and maintenance.

Quantum Transport: Low-temperature electronic transport; quantum oscillation analysis.

Molecular Beam Epitaxy: MBE system construction, commissioning, and optimization; controlled growth and atomic-scale engineering of one- and two-dimensional quantum materials.

RESEARCH LEADERSHIP AND MENTORING

- Trained junior researchers in low-temperature STM operation, dilution-refrigerator operation, data acquisition, and instrument troubleshooting.
- Led experimental development, measurements, and quantitative analysis for STM studies of quantum Hall states in gated graphene devices.
- Coordinated complementary STM and quantum-transport studies of correlated phases in rhombohedral multilayer graphene.

CONFERENCE PRESENTATIONS

GRC on Two Dimensional Electronics Beyond Graphene, Manchester, NH, June 2026.

“Real-space Imaging of Quantum Hall Quasiparticles”, Poster presentation

APS Global Physics Summit, Denver, CO, March 2026.

“Superconductivity and ferroelectric orbital magnetism in semimetallic rhombohedral hexalayer graphene”, Oral presentation

APS Global Physics Summit, Anaheim, CA, March 2025.

“Symmetry Engineering of van der Waals magnetic VCl_3 monolayer”, Oral presentation

Chinese Materials Conference, Shenzhen, China, July 2023.

“Observations of correlated behaviors in one-dimensional W_6Te_6 wires”, Oral presentation

Chinese Physical Society Fall Meeting, online, October 2021.

“Tuning band structures and electron-correlations of one-dimensional W_6Te_6 wires”, Oral presentation

PROFESSIONAL SERVICE

Reviewing

Nature(2)